SEQUENCE LISTING

<110> KAMINSKI, PIERRE-ALEXANDRE

<120> N-DEOXYRIBOSYL TRANSFERASES OF LACTOBACILLUS FERMENTUM
AND USE FOR THE ENZYMATIC SYNTHESIS OF
2',3'-DIDEOXYNUCLEOSIDES AND
2',3'-DIDEHYDRO-2',3'-DIDEOXYNUCLEOSIDES

<130> 296011US

<140> 10/594,766
<141> 2006-09-28

<150> PCT/FR05/000743
<151> 2005-03-29

<150> FR 0403319
<151> 2004-03-30

<160> 32

<170> PatentIn Ver. 3.3

<210> 1
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<212> DNA
<213> Lactobacillus fermentum

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gaagaacaac gtgcccgcat ccctcaagct ctagcccaac tagaagccaa cccgactgtc 120
ggcgttgttc accagccatt cgatttccaa tataaagatg cacgcgtaga ctccgatcct 180
gccggcgtct ttggcagcct cgaatggcaa attgccactt acaataacga cctcaacgcg 240
gtaggaactt ccgatgtctg cgttgcttta tacgatatgg accaaattga cgaaggaatt 300
tgtatggaaa tcggcatgtt cgtcgccctc cataaaccta tcgttttact acctttact 360
aagaaagata agtctgctta tgaagctaac ctaatgctag cacggggtgt aactacctgg 420
ttggaaccta atgactttag tcccttaaaa gactttaact ttaaccaccc aatggctcaa 480
cctttcccac cattcaaggt tttc 504

<210> 2
<211> 168
<212> PRT
<213> Lactobacillus fermentum

<400> 2
Met Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr
1 5 10 15

Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
20 25 30

Gln Leu Glu Ala Asn Pro Thr Val Gly Val Val His Gln Pro Phe Asp
35 40 45

Phe Gln Tyr Lys Asp Ala Arg Val Asp Ser Asp Pro Ala Gly Val Phe
50 55 60

Gly Ser Leu Glu Trp Gln Ile Ala Thr Tyr Asn Asn Asp Leu Asn Ala
65 70 75 80

Val Gly Thr Ser Asp Val Cys Val Ala Leu Tyr Asp Met Asp Gln Ile
85 90 95

Asp Glu Gly Ile Cys Met Glu Ile Gly Met Phe Val Ala Leu His Lys
100 105 110

Pro Ile Val Leu Leu Pro Phe Thr Lys Lys Asp Lys Ser Ala Tyr Glu
115 120 125

Ala Asn Leu Met Leu Ala Arg Gly Val Thr Thr Trp Leu Glu Pro Asn
130 135 140

Asp Phe Ser Pro Leu Lys Asp Phe Asn Phe Asn His Pro Met Ala Gln
145 150 155 160

Pro Phe Pro Pro Phe Lys Val Phe
165

<210> 3
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<212> DNA
<213> Lactobacillus fermentum

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gaagaacaac gtgcccgcat ccctcaagct ctagcccaac tagaagccaa cccgactgtc 120
ggcgttgttc accagccatt cgatttccaa tataaagatg cacgcgtaga ctccgatcct 180
gccggcgtct ttggcagcct cgaatggcaa attgccactt acaataacga cctcaacgcg 240
gtaggaactt ccgatgtctg cgttgcttta tacgatatgg accaaattga cgaaggaatt 300
tgtatggaaa tcggcatgtt cgtcgccctc cataaaccta tcgttttact acctttttact 360
aagaaagata agtctgctta tgaagctaac ctaatgctag cacggggtgt aactacctgg 420
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<210> 4
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<212> PRT
<213> Lactobacillus fermentum

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Met Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Thr Thr
1 5 10 15

Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
20 25 30

Gln Leu Glu Ala Asn Pro Thr Val Gly Val Val His Gln Pro Phe Asp
35 40 45

Phe Gln Tyr Lys Asp Ala Arg Val Asp Ser Asp Pro Ala Gly Val Phe
50 55 60

Gly Ser Leu Glu Trp Gln Ile Ala Thr Tyr Asn Asn Asp Leu Asn Ala
65 70 75 80

Val Gly Thr Ser Asp Val Cys Val Ala Leu Tyr Asp Met Asp Gln Ile
85 90 95

Asp Glu Gly Ile Cys Met Glu Ile Gly Met Phe Val Ala Leu His Lys
100 105 110

Pro Ile Val Leu Leu Pro Phe Thr Lys Lys Asp Lys Ser Ala Tyr Glu
115 120 125

Ala Asn Leu Met Leu Ala Arg Gly Val Thr Thr Trp Leu Glu Pro Asn
130 135 140

Asp Phe Ser Pro Leu Lys Asp Phe Asn Phe Asn His Pro Met Ala Gln
145 150 155 160

Pro Phe Pro Pro Phe Lys Val Phe
165

<210> 5
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic oligonucleotide

<400> 5
caatttcaca caggaaacac atatgaccat gattacgcc 39

<210> 6
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
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<400> 6
tgtttcctgt gtgaaattgt tatccgctca c 31

<210> 7
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic oligonucleotide

<400> 7
gatatacata tgaaaaatac cgacccagtt gc 32

<210> 8
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic oligonucleotide

<220>
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<222> (1)..(2)
<223> a, t, c, g, unknown or other

<400> 8
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<210> 9
<211> 22
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 9
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<210> 10
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic primer

<400> 10
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<210> 11
<211> 33
<212> DNA
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<220>
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<210> 12
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<400> 12
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<211> 33
<212> PRT
<213> Lactobacillus acidophilus

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Glu Lys Gln Asn Lys Ala Tyr Lys Ala Ala Met Glu Ala Leu Lys Gln
20 25 30

Asn

<210> 14
<211> 32
<212> PRT
<213> Lactobacillus helveticus

<400> 14
Met Asn Lys Lys Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn Glu
1 5 10 15

Lys Gln Asn Lys Ala Tyr Lys Glu Ala Met Ala Ala Leu Lys Glu Asn
20 25 30

<210> 15
<211> 31
<212> PRT
<213> Lactobacillus leichmannii

<400> 15
Met Pro Lys Lys Thr Ile Tyr Phe Gly Ala Gly Trp Phe Thr Asp Arg
1 5 10 15

Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn
20 25 30

<210> 16
<211> 31
<212> PRT
<213> Lactobacillus leichmannii

<400> 16
Met Pro Lys Lys Thr Ile Tyr Phe Ser Ala Gly Trp Phe Thr Asp Arg
1 5 10 15

Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn
20 25 30

<210> 17
<211> 35
<212> PRT
<213> Lactobacillus helveticus

<400> 17
Met Lys Ala Val Val Pro Thr Gly Lys Ile Tyr Leu Gly Ser Pro Phe
1 5 10 15

Tyr Ser Asp Ala Gln Arg Glu Arg Ala Ala Lys Ala Lys Glu Leu Leu
20 25 30

Ala Lys Asn
35

<210> 18
<211> 22
<212> PRT
<213> Lactobacillus gasseri

<400> 18
Met Thr Lys Gln Lys Thr Val Tyr Phe Gly Ala Gly Trp Phe Thr Glu
1 5 10 15

Thr Gln Asn Lys Ala Tyr
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<210> 19
<211> 37
<212> PRT
<213> Lactobacillus fermentum

<400> 19
Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr
1 5 10 15

Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
20 25 30

Gln Leu Glu Ala Asn
35

<210> 20
<211> 37
<212> PRT
<213> Lactobacillus fermentum

<400> 20
Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Thr Thr
1 5 10 15

Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
20 25 30

Gln Leu Glu Ala Asn
35

<210> 21
<211> 32
<212> PRT
<213> Oenococcus oeni

<400> 21
Met Asn Met Ala Lys Asn Ile Tyr Leu Ala Ser Pro Phe Phe Asp Asp
1 5 10 15

Glu Gln Ile Ala Arg Val Lys Lys Ile Glu Lys Ala Leu Glu Ser Asn
20 25 30

<210> 22
<211> 28
<212> PRT
<213> Leuconostoc mesenteroides

<400> 22
Lys Asn Val Tyr Leu Ala Ser Pro Phe Phe Asp Lys Glu Gln Ile Glu
1 5 10 15

Arg Val Glu Arg Val Glu Lys Ala Leu Ala Ala Asn
20 25

<210> 23
<211> 26
<212> PRT

<213> Lactobacillus plantarum

<400> 23
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Gln Gln Val Lys Ser Ala Leu Leu Ala Asn
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<210> 24
<211> 20
<212> PRT
<213> Lactobacillus lactis

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1 5 10 15

Gln Ile Lys Lys
20

<210> 25
<211> 158
<212> PRT
<213> Lactobacillus helveticus

<400> 25
Met Asn Lys Lys Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn Glu
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Lys Gln Asn Lys Ala Tyr Lys Glu Ala Met Ala Ala Leu Lys Glu Asn
20 25 30

Pro Thr Val Asp Leu Glu Asn Ser Tyr Val Pro Leu Glu Asn Gln Tyr
35 40 45

Lys Gly Ile Arg Ile Asp Glu His Pro Glu Tyr Leu His Asn Ile Glu
50 55 60

Trp Ala Ser Ala Thr Tyr His Asn Asp Leu Val Gly Ile Lys Thr Ser
65 70 75 80

Asp Val Met Leu Gly Val Tyr Leu Pro Glu Glu Glu Asp Val Gly Leu
85 90 95

Gly Met Glu Leu Gly Tyr Ala Leu Ser Gln Gly Lys Tyr Ile Leu Leu
100 105 110

Val Ile Pro Asp Glu Asp Tyr Gly Lys Pro Ile Asn Leu Met Ser Trp
115 120 125

Gly Val Cys Asp Asn Ala Ile Lys Ile Ser Glu Leu Lys Asp Phe Asp
130 135 140

Phe Asn Lys Pro Arg Tyr Asn Phe Tyr Asp Gly Ala Val Tyr
145 150 155

<210> 26
<211> 159
<212> PRT
<213> Lactobacillus acidophilus

<400> 26
Met Met Ala Lys Thr Lys Thr Leu Tyr Phe Gly Ala Gly Trp Phe Asn
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Glu Lys Gln Asn Lys Ala Tyr Lys Ala Ala Met Glu Ala Leu Lys Gln
20 25 30

Asn Pro Thr Val Asp Leu Glu Asn Ser Tyr Val Pro Leu Glu Asn Gln
35 40 45

Tyr Lys Asp Ile Arg Val Asp Glu His Pro Glu Tyr Leu His Asp Ile
50 55 60

Glu Trp Ala Ser Ala Thr Tyr His Asn Asp Leu Ile Gly Ile Lys Ser
65 70 75 80

Ser Asp Ile Met Leu Gly Val Tyr Leu Pro Glu Glu Glu Asp Val Gly
85 90 95

Leu Gly Met Glu Leu Gly Tyr Ala Leu Ser Gln Gly Lys Tyr Ile Leu
100 105 110

Leu Val Ile Pro Asp Glu Asp Tyr Gly Lys Pro Ile Asn Leu Met Ser
115 120 125

Trp Gly Val Cys Asp Asn Ala Ile Lys Ile Ser Glu Leu Lys Asp Phe
130 135 140

Asp Phe Asn Lys Pro Arg Phe Asn Phe Tyr Asp Gly Ala Val Tyr
145 150 155

<210> 27
<211> 149
<212> PRT
<213> Lactobacillus johnsonii

<400> 27
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Met Ser Ala Leu Asn Ala Asn Pro Thr Ile Asp Leu Glu Asn Ser Tyr
20 25 30

Val Pro Leu Gln Asn Gln Tyr Lys Asp Ile Arg Val Asp Glu His Pro
35 40 45

Glu Tyr Leu His Asp Lys Glu Trp Ala Gln Ala Thr Tyr Asn Gly Asp
50 55 60

Leu Val Gly Ile Lys Thr Ser Asp Val Met Leu Gly Val Tyr Val Pro
65 70 75 80

Lys Glu Glu Asp Val Gly Leu Gly Met Glu Leu Gly Tyr Ala Met Ser
85 90 95

Gln Gly Lys Tyr Val Leu Leu Val Ile Pro Asp Glu Leu Tyr Gly Glu
100 105 110

Ser Ile Asn Leu Met Ser Trp Gly Val Ala Asp Asn Val Ile Lys Met
115 120 125

Ser Glu Leu Ala Thr Phe Asp Phe Asn Arg Pro Arg Tyr Asn Phe Tyr
130 135 140

Asp Gly Ala Val Tyr
145

<210> 28
<211> 157

<212> PRT
<213> Lactobacillus leichmannii

<400> 28
Met Pro Lys Lys Thr Ile Tyr Phe Gly Ala Gly Trp Phe Thr Asp Arg
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Gln Asn Lys Ala Tyr Lys Glu Ala Met Glu Ala Leu Lys Glu Asn Pro
20 25 30

Thr Ile Asp Leu Glu Asn Ser Tyr Val Pro Leu Asp Asn Gln Tyr Lys
35 40 45

Gly Ile Arg Val Asp Glu His Pro Glu Tyr Leu His Asp Lys Val Trp
50 55 60

Ala Thr Ala Thr Tyr Asn Asn Asp Leu Asn Gly Ile Lys Thr Asn Asp
65 70 75 80

Ile Met Leu Gly Val Tyr Ile Pro Asp Glu Glu Asp Val Gly Leu Gly
85 90 95

Met Glu Leu Gly Tyr Ala Leu Ser Gln Gly Lys Tyr Val Leu Leu Val
100 105 110

Ile Pro Asp Glu Asp Tyr Gly Lys Pro Ile Asn Leu Met Ser Trp Gly
115 120 125

Val Ser Asp Asn Val Ile Lys Met Ser Gln Leu Lys Asp Phe Asn Phe
130 135 140

Asn Lys Pro Arg Phe Asp Phe Tyr Glu Gly Ala Val Tyr
145 150 155

<210> 29
<211> 168
<212> PRT
<213> Lactobacillus fermentum

<400> 29
Leu Lys Asn Thr Asp Pro Val Ala Asn Thr Lys Ile Tyr Leu Ala Thr
1 5 10 15

Ser Phe Phe Asn Glu Glu Gln Arg Ala Arg Ile Pro Gln Ala Leu Ala
20 25 30

Gln Leu Glu Ala Asn Pro Thr Val Gly Val Val His Gln Pro Phe Asp
35 40 45

Phe Gln Tyr Lys Asp Ala Arg Val Asp Ser Asp Pro Ala Gly Val Phe
50 55 60

Gly Ser Leu Glu Trp Gln Ile Ala Thr Tyr Asn Asn Asp Leu Asn Ala
65 70 75 80

Val Gly Thr Ser Asp Val Cys Val Ala Leu Tyr Asp Met Asp Gln Ile
85 90 95

Asp Glu Gly Ile Cys Met Glu Ile Gly Met Phe Val Ala Leu His Lys
100 105 110

Pro Ile Val Leu Leu Pro Phe Thr Lys Lys Asp Lys Ser Ala Tyr Glu
115 120 125

Ala Asn Leu Met Leu Ala Arg Gly Val Thr Thr Trp Leu Glu Pro Asn
130 135 140

Asp Phe Ser Pro Leu Lys Asp Phe Asn Phe Asn His Pro Met Ala Gln
145 150 155 160

Pro Phe Pro Pro Phe Lys Val Phe
165

<210> 30
<211> 167
<212> PRT
<213> Lactobacillus helveticus

<400> 30
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1 5 10 15

Tyr Ser Asp Ala Gln Arg Glu Arg Ala Ala Lys Ala Lys Glu Leu Leu
20 25 30

Ala Lys Asn Leu Ser Ile Ala His Val Phe Phe Pro Phe Asp Asp Gly
35 40 45

Phe Thr Asp Pro Asp Glu Lys Asn Pro Glu Ile Gly Gly Ile Arg Ser
50 55 60

Met Val Trp Arg Asp Ala Thr Tyr Gln Asn Asp Leu Thr Gly Ile Ser
65 70 75 80

Asn Ala Thr Cys Gly Val Phe Leu Tyr Asp Met Asp Gln Leu Asp Asp
85 90 95

Gly Ser Ala Phe Glu Ile Gly Phe Met Arg Ala Met His Lys Pro Val
100 105 110

Ile Leu Val Pro Phe Thr Glu His Pro Glu Lys Glu Lys Lys Met Asn
115 120 125

Leu Met Ile Ala Gln Gly Val Thr Thr Ile Ile Asp Gly Asn Thr Glu
130 135 140

Phe Glu Lys Leu Ala Asp Tyr Asn Phe Asn Glu Cys Pro Phe Asn Pro
145 150 155 160

Val Arg Gly Tyr Gly Ile Tyr
165

<210> 31
<211> 146
<212> PRT
<213> Leuconostoc mesenteroides

<400> 31
Met Ser Gln Ile Tyr Leu Ala Gly Pro Phe Phe Ser Asp Glu Gln Ile
1 5 10 15

Asp Arg Val Lys Arg Ile Glu Ala Ala Leu Asp Ser Asn Pro Thr Val
20 25 30

Thr Asp Tyr Tyr Ser Pro Arg Lys His Gln Lys Thr Glu Asn Pro Glu
35 40 45

Phe Thr Ser Pro Trp Ala Ala Glu Val Phe Gln Arg Asp Ile Lys Asn
50 55 60

Val Thr Asp Ala Asp Ile Ile Leu Ser Ile Ile Asp Tyr Arg Asp Asn
65 70 75 80

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Asp Ala Asp Ser Gly Thr Ala Phe Glu Gln Gly Met Ala Trp Val Gln
                 85                  90                  95

Lys Lys Pro Ile Ile Val Phe Asn Glu Leu Lys Phe Pro Val Asn Leu
            100                 105                 110

Met Leu Ser Glu Ser Leu Thr Ala Tyr Ile Thr Asn Ser Asp Asp Ile
        115                 120                 125

Ala Thr Tyr Asp Phe Asp Gln Thr Pro Lys Leu Pro Phe Thr Gly Glu
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Leu Phe
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<210> 32
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<213> Prochlorococcus marinus

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            20                  25                  30

Leu Gly Ala Glu Val Trp Glu Pro Phe Ser Arg Asn Ala Gln Tyr Glu
        35                  40                  45

Asn Leu Gln Pro Gly Trp Ala His Asp Ile Ala Leu Ala Asp Leu Arg
    50                  55                  60

Asp Val Arg Asn Ser Asp Gly Ile Leu Ala Val Val Asn Gly Thr Pro
65                  70                  75                  80

Pro Asp Glu Gly Val Met Ile Glu Leu Gly Ala Ala Ile Ala Leu Gly
                85                  90                  95

Lys Pro Thr Phe Leu Phe Arg Asp Asp Phe Arg Arg Cys Ser Asp Ser
            100                 105                 110

Glu Glu Tyr Pro Leu Asn Leu Met Leu Phe Ala Gly Leu Pro Ser Ile
        115                 120                 125

Gly Trp Asn Asp Tyr Phe Tyr Thr Ser Ile Glu Glu Leu Ser Asp Pro
    130                 135                 140

Lys Lys Ser Leu Ala Ile Trp Leu Lys Asp
145                 150
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